Battelle
Memorial Institute

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To prepare you for the challenge of the '80s, a major new educational program series in

Data Processing & Information Technology

"The explosive growth of computing power is changing the structure and economics of data processing so rapidly that most data processing knowledge acquired in the '70s cannot meet the demands of the '80s...." page 2

The Program Series: July 1981-April 1982

New York Washington Chicago Boston
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Memorandum to: Data Processing Professionals

The explosive growth of computing power is changing the structure and economics of data processing so rapidly that most data processing knowledge acquired in the '70s cannot meet the demands of the '80s.

As a data processing professional you are acutely aware that coping with change in the information technology disciplines is a major challenge to you in the '80s. New issues confront you constantly. How you understand them and deal with them will have a measurable impact on your professional growth and the productivity of your organization.

For most data processing professionals, continuing education has become a built-in part of their lives. The educational programs detailed in this catalog are designed to reflect the changes taking place in the field and to be responsive to your specific needs.

In the technological environment of the '80s, we have identified the following issues as central to what is, and will be, taking place:

1. In a world of increasingly complex decision making, attention is focusing on management productivity. Computer-generated information is being used more and more for daily problem solving and decision making at operational levels.

2. Users of computer-generated information at all levels are becoming significantly more influential in determining how their information needs are fulfilled.

3. The ways in which information is packaged, delivered and used are changing dramatically.

4. While the cost of information processing continues to drop sharply, related personnel costs are going up and productivity is now a major concern.

5. Data processing managers are becoming information resource managers.

6. Data processing and communications technology are becoming more intertwined.

7. Hard questions are being asked about organizational structures, with pressures growing to redesign organizations to deal with the dual need for both centralization and decentralization of information management facilities.

To help you cope with the data processing challenge of the '80s, I urge you to examine this catalog and select the seminars that will directly benefit your career and your organization. The return on your investment in new knowledge can be substantial.

Cordially,

James M. McDonald, Jr.
Director, Battelle Seminars and Studies Program

The Seminars and Battelle's Commitment to Quality

Any successful educational program must be in tune with changes taking place in technology, the economy, and organizational needs. We have done extensive research and planning to assure you that the seminars are:

1. Timely. The subjects reflect today's needs of professionals in light of changes now taking place in the field and in the way organizations function.

2. Well-organized. We plan the seminars so that they communicate what you need to know in the time allotted.

3. Practical. The seminars are totally oriented to the individual who wants to apply immediately the information acquired.

4. Aimed at professionals with common interests. The sharp focus of each seminar in this catalog tends to bring together attendees with common objectives.

5. Educationally sound. Our instructors are leaders in their subjects and are excellent communicators.

The small size of the seminar groups will give you ample opportunity to interact with instructors and other participants and to air your own problems and questions. The seminars thus maximize your learning experience.

These seminars are sponsored by the Battelle Seminars and Studies Program, a corporate educational services component of Battelle Memorial Institute, an independent nonprofit multinational organization devoted to the use of science and technology for the benefit of mankind. Battelle has a staff of some 7,000 scientists, engineers and support personnel at major research centers in Columbus, Ohio; Richland, Washington; Frankfurt, Germany; and other sites for specialized activities. From its income, Battelle supports a wide variety of charitable and educational programs.

Battelle scientists and engineers are at the forefront of computer technology, utilizing their expertise in a broad range of both hardware and software applications, including management information systems, computer graphics, modeling and analysis, data acquisition and process control, robotics, and distributed systems.

Battelle Columbus Laboratories (BCL) has developed ACTS, a powerful new software development tool that promises productivity increases far surpassing more conventional approaches. Designed specifically to monitor project development status and expedite creation of complex on-line transaction application systems using large integrated data bases, ACTS gives a project team control over its development activities never before attainable. ACTS has exceeded all expectations in the development of the Marine Safety Information System for the U.S. Coast Guard, and BCL plans to apply ACTS to banking, project management, and other on-line developments. BCL has also produced BASIS, a data management system designed to run on IBM, CDC, Univac and DEC mainframes. It has been installed on 60 computers at 31 sites. BCL's Intelligent Device and Microcomputer Systems group applies microcomputer technology in settings ranging from the space shuttle to industrial process control. The group issues the monthly Microcomputer Applications and Technology Center newsletter.

Battelle-Northwest (BNW) in Richland, Washington, has developed numerous specialized mini-computer and microcomputer-based data acquisition and control systems. A general-purpose data acquisition system has been developed to provide concurrent data analysis, data verification, color-graphic display and on-line video taping of test results. Project operating personnel given little training can operate the system. Key features include on-line user instructions, pseudosensors, historical display and users' specified reports. BNW is currently conducting research in statistics and computer science directed at developing and implementing methods to analyze large volumes of research data which will result in a more affordable computational resource for industry.

Strategic Planning for Management Information Systems

Seminar Objectives—What You Will Learn

Many organizations are concerned about the impact that new data processing technologies and techniques may have on their present investment in computer equipment and people. Do you have a cogent EDP plan for the 1980's? Are you certain that your planning is based on a clear understanding of information processing in the years ahead? Do you want to order a larger computer but are not certain if it is really necessary? Are you concerned that your data processing costs have been rising substantially each year for the past five years and do you wonder if there is an end in sight? Are there complaints about poor service delivered by your MIS group? Strategic planning deals with issues such as these. The need for effective strategic planning for the EDP function is of crucial importance to all levels of responsibility within the data processing activity—and many levels of management outside of it.

You will learn: How to develop strategies and prepare practical, workable, operations plans for effectively managing MIS resources—Planning principles and processes for developing sound plans—How to define significant issues that need to be resolved and how to specify your organization's current and future information processing needs—How to identify improvement opportunities and to develop means of capitalizing on them—Ways to design an overall strategy to attain certain goals and objectives—How to obtain management's support for the strategic plan, to develop operational plans to manage systems development projects, to ensure availability of equipment capacity when needed, to manage human resources effectively.

Program Description

1. An effective planning methodology.
Importance and objectives of planning, the risks and obstacles involved, overcoming planning deterrents, how to get started. The relationships among mission, goals, objectives and plans—and how they form the planning "pyramid." What are the six principles professionals use when developing practical, comprehensive plans? What are the different kinds of plans that can be developed, and the depth and breadth of planning for each kind? The 12 steps in the planning process and how to involve management. What are the different kinds of planning end products, how can they be integrated with other planning documents? What kinds of needs are involved in selling the plan to management?

2. What the strategic plans consist of.
How to define the key issues in developing an MIS strategic plan. Writing an accurate mission statement and forming realistic goals and objectives for your company's MIS function. How to crystallize users' information processing requirements, separating fact from fiction. Defining a superior information delivery service within a realistic budget. Planning for users' special and unpredictable information needs. The importance of developing "in principle" solutions: why and how professional problem solvers develop solutions "in principle," objectively evaluate and cost out alternatives, and select the most appropriate solution—testing for the presence of three characteristics: workability, timeliness and salability. Designing an overall strategy: the importance of documenting the plan's basic assumptions, developing a conceptual plan, even before all the facts have been gathered, and linking the strategy to the company's plan.

3. Operational plan No. 1—systems development projects.
Translating information needs into systems requirements. What are the planning considerations involved in purchasing prepackaged software vs. building your own systems. How you can make these plans believable. How you can accurately define and estimate the effort involved in systems development projects; how you can avoid overrunning the budget and schedule. How to prepare and use estimating standards. Setting priorities is crucial. Cost/benefit method for establishing priorities and gaining their acceptance by management and users. Preparing the actual plan: allocating resources, scheduling the projects, developing contingency plans.

4. Operational plan No. 2—equipment capacity.
Two planning approaches to deal with the seven deadly sins of equipment planning. How to forecast equipment expansion; translating systems requirements into equipment requirements, using the critical characteristics of equipment that affect performance—cycle time, number and size of channels, transfer speeds. How and why to use the experiences of others; pioneering is risky! Need for lead time and contingency planning in installing new equipment. Using performance tests before delivery, acceptance tests after delivery to avoid schedule delays. How to deal with vendors.

5. Operational plan No. 3—human resources.
How to estimate staffing needs. Inventorying needed skills, translating systems and equipment requirements into staffing needs. Three approaches to staff training: the related planning considerations. How to schedule individual workloads to avoid schedule overcommitments and conflicts.

6. Final steps—preparing, selling and monitoring the plan.
How to choose the right format for your plan. Tips for making it easy to read. Selling your plan to management—what the different kinds of benefits your plan can have, how they can be measured, ways to present them to management. How to monitor and update your plan. Use of "deliverables" and concrete events as progress review checkpoints. Manual and automated systems for monitoring performance and reporting progress. Developing productivity data and using them to improve estimating.

About the Seminar Leader

William O'Brien.
Founder and President of Information Processing Consultants, Inc.—Has been in data processing for 25 years—Specializes in the development of management information systems and management of the EDP function—As a Principal of Cresap, McCormick and Paget, Inc. (1963-1973), directed that firm's systems and data processing practice in eastern U.S., Canada and Mexico—Had been with IBM and Honeywell—Founding member of Institute of Management Consultants and a Certified Management Consultant (CMC)—Frequent lecturer and instructor—Has B.A. from Brown University.

Decision Support Systems

Seminar Objectives—What You Will Learn

The "buzz word" of the '80's is "Decision Support Systems." A key issue for most organizations is management productivity —how to increase the return on large dollars invested in managerial and professional decision making. The ultimate objective of information systems must increasingly be to improve the effectiveness and productivity of key personnel—those whose daily decisions are based on rapid and convenient access to data on an organization's internal and external environments. The rapidly declining cost of computer hardware and the development of highly functional user-friendly software tools have provided the means to perform a broad variety of information management tasks. Directly related is work going on in the integration of office automation and data processing. Decision support systems are useful in such functions as: sales forecasting, budget and cash flow forecasting, capital allocation, market strategy development, acquisition analysis, new venture analysis. We particularly recommend this seminar for information systems management and systems analysts/designers who want to be leaders in what has become a vital area.

You will learn: How to determine the critical information requirements of your organization's decision makers—What resources you need to properly build decision support systems—How to design and implement several types of DSS—How to gain management confidence and support for providing a DSS environment—How to capitalize on user interest in this type of capability.

Program Description

1. The key role of decision support systems.
Movement of decision support systems from an academic discussion topic to a viable management support tool with genuine everyday utility. "Decision support systems" vs. "decision-making systems." Why the former is flourishing while the latter is not. What is the "systems pyramid" and where does DSS fit in the total scope of information management? How the degree of problem structure affects the usefulness of decision support. Determining DSS information requirements.

2. Types of decision support systems.
"Model-based DSS" and their use in business organizations: risk analysis, strategic planning, market forecasting, marketing planning, credit granting. "Data-based DSS" as an information resource. Flexible inquiry language applications: personnel and benefit planning, financial planning and analysis, foreign currency exposure analysis. Many more examples will give clear insight into differences and similarities.

3. Relationship of DSS to other information systems and data sources.
The relationships of some types of DSS to operational data processing systems. Other sources of data for DSS: public data bases (econometric data, legislative information, corporate performance), industry data. The tradeoff between direct access to operational data bases and the use of extracts. When and how to use both. Means of access to public data bases.

4. Tools for building DSS.
Software and hardware tools for DSS implementation: procedural and non-procedural languages, data base management systems, DSS generators, time sharing, graphics, micro computers, automated office equipment. Stand-alone solutions vs. interactive access to large mainframe computers. Relevance of tools to specific application types.

5. DSS development methodology.
The nature of the typical DSS and the distinction with traditional DP systems. Implications for the normal phased system development process. "Bread-boarding" and the concept of a "pilot" in DSS development. Adaptive "middle-out" design as opposed to "top-down" or "bottom-up."

6. DSS support environment.
Essentials of a DSS support environment. Finding and keeping the right kind of people. Hardware and software resources required. Putting the information systems organizations out in front in delivering practical decision support systems and gaining management confidence and support.

7. Productivity benefits.
Specific examples of managerial and professional productivity gains. Relationship of managerial productivity to clerical productivity. "Cost savings" vs. "cost avoidance" vs. "value-added." The bottom line impact of DSS.

8. Case studies/exercise.
Several case studies of successful decision support systems to demonstrate usefulness of the concept. Exercise for participants will define an approach to building a DSS for a particular management problem using tools and techniques developed in the seminar.

About the Seminar Leader

Mark I. Grossman.
Consultant in information systems, and financial and administrative management—Has been responsible for analysis design, implementation and support of computer-based information systems in finance, marketing, materials and operations —Directed design and implementation of an on-line multi-division receivable systems—Designed and implemented a model for analysis of capital investments under uncertainty—Developed various other models and decision support systems —At RCA Corp., has been Senior Operations Research Analyst, Manager of MIS Finance and Administration, Director of Financial Systems—Member: ACM, The Institute for Management Science, Society for Management Information Systems, Operations Research Society of America—Has B.S. in mathematics from MIT, M.S. in physics from Rutgers, M.S. in statistics from Rutgers.

Data Communications: An Intensive Introduction

Seminar Objectives—What You Will Learn

No area of data processing is growing faster and in more directions than data communications. The range of facilities and services now available and those being planned is staggering. This has led to a very rapid growth in the use of data communications in all types and sizes of organizations—and has made an understanding of such concepts more important than ever. This seminar focuses on the principles of operation of basic data communications systems and networks, emphasizing the methods used rather than the technical details underlying these methods, providing an understanding of the practical uses of and design approaches to successful data communications systems.

You will learn: About the types of data communications facilities now available from telephone companies and other common carriers, and how to make a cost-effective choice—About the new procedures and protocols that are expanding the use of data communications into many different fields—Methods of putting networks together and the advantages of each method—How to use microwave, message switching, packet switching and satellite services—About data communications software—About system requirements and parameters—How to perform network testing and to fine-tune the network.

Program Description

1. Background/introduction.
The important differences between data communications and other aspects of data processing. Emphasis is placed upon the exploration of the complexities of data communications from the standpoint of management and control, caused in large part by the multiplicity of vendors and services that are usually involved in data communications installations, and by the variety of equipment, programming systems, and services available. Ways in which data communications is used and categories of data communications systems: information retrieval and updating, data entry and transaction processing systems, remote batch processing, time sharing, message and packet switching, production control. Concepts used in data communications networking and the equipment and programming components. Distributed processing and its impact.

2. Basic concepts.
Data representation: to be useful in data processing and data communications, information must be transformed into a form amenable to electronic handling—the bit, the character, and the message; information coding schemes, such as ASCII, EBCDIC, and why differences in codes are important, how they affect data communications, and why. Methods of transferring data, how data is changed, the impact of these transformations on the user of the system. Several methods of data transmission are explained, together with various types of circuits or communications links. Data communications protocols and their uses.

3. Network components.
Terminal equipment: teleprinters, display stations, cluster controllers, distributed processing systems and their variants, such as remote job entry systems or data entry systems, certain types of special-purpose transaction-oriented devices, such as point-of-sale and banking terminals, and data acquisition and control systems. Interfacing equipment, equipment used to interface terminals and other devices, such as communications controllers, to the communications links: modems, multiplexers, concentrators, packet-switching "gateways," and various kinds of port sharing and conversion equipment.

4. Communications service suppliers.
There is a bewildering range of communications service suppliers now available, presenting a bewildering range of different services: basic common carrier services and what you need to know to make a cost-effective choice. Satellite communications services and their advantages and problems for the network designer. Local networks for office technology installations, and their differences in technology from other types of communication services.

5. Data communications software: locations and functions.
The rapid increase in availability and use of programmable equipment, previously limited to a few components in a data communications network, has made software a major consideration in development and cost-effectiveness of networks. Generic categories of data communications software: where it is resident, what it does, who prepares it, who keeps it going, how it all works together, and some ground rules for choosing and operating it.

6. Putting it together: data communications systems design.
System requirements and parameters: data flow or traffic patterns, locations and generic types of terminal devices, types of transactions to be processed and their origins, types of system users. Network reliability considerations: the various ways of performing error detection and correction and how to go about assuring that the network's reliability, either in part or in whole, falls within the established limits. Principles of network architecture: several ways of putting a network together and some rules concerning the need for departure from the simple into the more complex network structures.

7. Keeping it together: administration and management.
A checklist for a set of overall network-oriented use and operating procedures that clearly establish and enforce rules for network maintenance and operation. What overall network standards should be—possible contents for a manual. Network monitoring and reporting: How well is it doing? How can we predict if and when things are going to be wrong? Is the user getting the expected response time or other service parameter? Hardware and software methods for gathering such information and also for fixing the network when things go wrong.

8. The future.
Some insights into developments now on the horizon of data communications but not yet a commercial reality—new interface standards, such as X.21, expanded and increasing use of satellites, the now withdrawn but still in the future ACS offering from the Bell System, and new trends in network design and implementation.

About the Seminar Leader

Henry C. Clark.
Consultant, with specialization in data communications, networking and distributed processing systems—Directed the evaluation, selection and contract negotiation for a major corporate installation of all data communications equipment—Developed conversion plans for a very large Department of Defense DP installation for going from second-generation equipment and software to up-to-date methodologies, including data base management systems and full-scale networking—Had been Manager, Data Communications Planning for Honeywell Information Systems; Division Chief, Computer Systems Development, Bureau of the Census; Director, Technical Services for Citibank's Transaction Technology, Inc.—Member, ACM, IEEE—B.S. from Columbia University.

Data Processing Contracts: Negotiation and Administration

Seminar Objectives—What you will learn

The proliferation of computer hardware (all sizes and shapes) and of vendors—and the explosive growth in the buying of software packages and services have exposed unwary buyers to a myriad of potential pitfalls and traps. Knowing how to negotiate a good contract is not just a task for the lawyers. The DP professional must know how to identify needs and objectives unambiguously and how to communicate them to the other members of the negotiating team—and to the vendor. There are very specific negotiating skills and knowhow that must be acquired. For this key purpose, we highly recommend this seminar for everyone involved in acquiring hardware, software and services.

You will learn:

- How to protect your proprietary and privacy rights in your data base and insure that they remain yours.
- How to articulate your specifications for file layouts, flowcharts, program documentation, output descriptions, user manuals, operations manuals, screen layouts, teleprocessing systems, packages and custom programming that will increase vendor responsiveness.
- How to define the business functions to be performed by your computer system and have the vendor warrant that the system he supplies you is fitted for your business's purpose.
- How to define systems and program modularity and why it will help reduce contract disputes.
- How to write contracts that will encourage your vendors to meet and beat schedule requirements.
- How to write penalty clauses and liquidated damages terms that will entice the vendor to make you his most important customer.
- How to define delivery and what constitutes delivery of the computer hardware, software and services items you contracted for.
- How to define the methods and parameters of acceptance testing and benchmarks.
- How to negotiate free data conversion services from your vendor.
- How to specify that the particular hardware system supplied to you is adequate and acceptable for running your systems and application software.
- How to have the vendor commit, in writing, that the programs and data base can be easily migrated to another computer system. Also, how to negotiate a fixed price for conversions.
- How to apply and modify standard law and covenants to your unique computer-related needs.
- How to spell out what a computer package will do; what is standard, optional and custom.
- How to avoid being "nickeled and dimed" by scope changes on fixed price contracts.
- The advantages and disadvantages of "turnkey" computer systems.
- How to write contract clauses defining hardware/software speed, efficiency and performance.
- How to assure that your vendors use "state of the art technology" and are penalized for "computer malpractice."
- How to negotiate favorable machine usage charges from your service bureau.
- How to write a "professional services" agreement for "contract programming" that will motivate a best efforts and on-time delivery.

Program Description

1. Preparing your negotiating team.
The prenegotiating meeting to introduce team members to the multidisciplinary world of data processing contracting—Development of the technical, legal, financial, management and insurance objectives—Developing team member jargon list, reference books, discipline cross references and sample usage—Establishing the communication language to be used by the team during negotiations and contracting.

2. A close look at contract alternatives for computer hardware, software services.
Definitions of terms to be used in the contract—Methods of acquisition including direct rentals, operating leases, financial leases, outright purchases—Examples of a financial, full payout lease with maintenance, taxes, insurance and residual value clauses, lessor/lessee depreciation and investment tax credits—Review of purchase contract terms for a standard software package—User rights, payment methods, support services, getting a warranty, software liability and maintenance—Checklist for a turnkey systems contract—Consulting and programming services contract terms—Ownership of ideas, materials and programs—Customized software packages and the contractual relationships between buyer and seller—Why it is not a labor/hours contract—The seller's responsibility for delivering a computer package—The need for a specification of the package to be constructed, i.e., tasks, software environment and files—Special handling of multiple hardware/software vendor contracts—Maintenance/error checking services for vendors—Joint solutions for interface problems—Replacing a vendor and combining responsibilities.

3. The goals of the buyer and seller.
Defining the buyer's needs and priorities—Establishing "what" the computer system will do for the buyer: Cost effectiveness, reduction of personnel, cash flow improvements, inventory reduction, customer service, etc.—Understanding the seller's goals and using them to get what you want.

4. Fundamental business, legal and technical terms for data processing contracts.
Equipment adequacy, acceptance rerun, lemon clause, force majeure, breach not waiver.

5. The negotiating team.
What are its members' individual responsibilities: for leading negotiations; for determining lease vs. rental, investment tax credits, cash flow; for defining product and service objectives, performance control needs, delivery procedure, acceptance criteria; for determining contract liability insurance coverage.

6. Development of a negotiating strategy.
Developing mutuality of understanding comes through effective negotiations—Negotiating strategy must include encouraging vendor to comprehend your needs and why you must satisfy them—Vendor should feel your satisfaction will benefit him also.

7. Data processing contract case studies.
Two cases involving consequential damages—Lessons in what to avoid.

8. Resolving contract disputes.
Once you have a dispute, subsequent actions you take are critical in helping avoid a lawsuit—Don't create situations that will generate damages for either or both parties—If a conflict is inevitable, first try settling your differences in a "moot court."

About The Seminar Leader

Leonard F. Turi
President of Technical Marketing Services, Inc., a consultant to the data processing field—Had been with CACI, Inc., General Electric, University Computing Co., RCA—Has managed computer projects for these companies and others such as Bell Laboratories, Singer Co.—Has managed computer personnel at companies such as Seiko, INCO, Con Edison, Manufacturers Hanover Trust—Has Associate Degree in architecture from Temple University, B.S. in business from Rutgers, Bachelor of Law from La Salle Extension University—Holds a CDP.

Data Processing and Office Automation: Technology and Management

Seminar Objectives—What You Will Learn

Much attention has been focused on automating office and administrative operations. But we're just at the beginnings of understanding which processes can be automated and how the relevant technologies can be integrated. Not the least of the problems is identifying and coping with the human and organizational issues. This seminar is designed to help the data processing professional understand the key issues and capitalize on the oportunities for productivity improvements, which are substantial.

You will learn: How four key technologies (microprocessors, minicomputers, telecommunications, networking) relate to office automation—What the roles are of computer graphics, electronic mail, word processing and teleconferencing—How to introduce new technologies—How to plan for and justify office automation—How to manage change—How to staff, train and organize for it.

Program Description

1. Introduction.
What is the automated office—the Office of the Future? What will it look like? What are its many desirable features? Who will be impacted by it? What are the many sensitive issues that have to be anticipated and dealt with?

2. Technologies that are key to office automation.
The four areas of technology that must be understood to capitalize on developing the automated office are: microprocessors, minicomputers, telecommunications and networking.

3. Major elements of office automation.
Automating the office can involve some or all of these elements: distributed data processing, computer graphics, word processing, electronic mail and facsimile processing, electronic filing, micrographics, teleconferencing, management work station concepts. Each will be discussed in terms of applications and possible configurations.

4. Implementation.
Success or failure in automating an office can be determined by the degree of understanding of these management requirements: planning; justification and acquisition of facilities; staffing and organizing; orientation and training; management of the project.

5. Managing change.
Change of any sort can be traumatic. Automating part or all of the information handling and management of a business will have impact on people, job functions, organizational structures and the physical environment. What are these changes and how can they be managed?

6. Information resource management.
As more organizations move towards the concept of "information resource management"—viewing information and data throughout the organization as needing to be managed—the automating of the office facilitates this.

About the Seminar Leader

Jagdish R. Dalal
Manager, Management Information Systems, Brookhaven National Laboratory; responsible for Administrative Systems, Management Systems and Data Processing—Had been Director, Systems and Data Processing, Teledyne CAE; had been in various engineering and financial positions with Ford Motor Co.—B.M.E. from Gujarat University, India; Master's in Industrial Engineering, Wayne State University.

Distributed Data Processing: Application of Minis and Micros

Seminar Objectives—What You Will Learn

Distributed data processing systems are rapidly expanding in numbers, and in the impact on businesses that employ them. There is an increasing user demand for processing power—for greater proximity, for greater control over scheduling, for greater control over costs, for greater flexibility. But there can be negatives: high cost of system and network development, need for effective end user education, difficulties of network maintenance and management. In the absence of sound knowledge and experience, the benefits that distributed systems promise can be lost. This seminar covers the key aspects of DDP: technology, problems and opportunities.

You will learn: Why distributed processing is encouraged by the very data processing people who oppose it—What DDP offers to the corporation and its user managers—How to avoid the problems that are usually associated with distributed processing—How the headquarters computer people can avoid losing control of data processing, while benefiting from DDP—How the hardware elements of a minicomputer system differ from those of a mainframe—How to select components that meet present and future requirements—What the essential elements of minicomputer software are, and how to evaluate them—An overview of data communications as the link between distributed systems—When to apply the system life cycle approach to new applications—How to size an application—Why many implementations fail, and how to be sure yours won't—Which vendor to choose, and how to manage the relationship—The elements of successful negotiation with hardware and software vendors.

Program Description

1. DDP concepts and definitions.
The negatives of central computer performance that spur an interest in distributed data processing: lengthy turnaround time, inflexibility for changing programs, too-high charges, user frustration. Benefits of DDP: lower costs, greater impact on ROI, offloading of the mainframe, greater ability to capitalize on advances in technology. Benefits and pitfalls: how to gain one and avoid the other.

2. Hardware elements: the tangible foundations of DDP.
Minicomputers and microprocessors as the principal ingredients of DDP. Capabilities and characteristics of central processing units. Primary memory—its significance in cost, size, speed and accuracy. Secondary storage: types, capacities, costs and constraints. CRT workstations—the man/machine interface. Printers—matrix, impact and others—a comparative analysis that assures the right printer for each application.

3. Software elements: intangible but all-important.
The operating system as the real brains behind the computers. Utilities—wheels that need not be reinvented. Productivity aids for efficient programming. Data base management ensures effective handling of a company's most important asset. Programming languages—a survey of those commonly used with small computers. Applications programs get the job done. Software packages as an alternative to custom programming—with a check list to assure successful acquisition and implementation.

4. Data communications: getting it all together.
Network configurations to suit the needs. How to choose from available media. Understanding protocols. On-line and batch communications. Using front-end systems to relieve the CPU burden. Concentrators and multiplexers. Modems and modulation methods. How to use data communications to assure the success of a distributed processing network.

5. The system life-cycle: ignore it at your peril.
Feasibility study, functional specifications, preliminary design, systems design, programming specification, development and implementation—why they are all necessary to avoid failure. How to select an application for distributed processing. How to determine the application's requirements. How to ensure that file sizes, response time and throughput will be adequate for present and future needs.

6. Selecting and managing vendors: a guide for the vulnerable.
Which comes first—the hardware or the software. *Caveat emptor*—let the buyer beware. How to evaluate vendors and their offerings—pros and cons of decision matrices. Consultants, software houses and turnkey systems integrators can help or hinder, depending on how you handle them. Maintenance of hardware and software as a critical element in selection and operation. Contract negotiation principles.

7. Systems implementation: making it work.
Acceptance testing as a go/no-go signal. Operator and user training methods. The conversion process—what it entails and why it often fails. Parallel operation as a costly but necessary prerequisite to "going live." The post-implementation audit measures the degree to which objectives were achieved, and points the way to further improvements.

8. What the future holds.
Word processing, electronic mail, computer conferencing, home interconnections to business computers; all will become widespread in the immediate future. Rapid technological developments in VSLI, cryogenics, fibre optics and satellite communications will speed these advances and encourage others as yet unseen. Future directions and their impact on personal and business lives will be discussed.

9. Security and controls: DDP's Achilles' heel.
Why DDP is more susceptible to fraud and error than centralized systems. Data communications provide entry for the unwanted. Unrestricted machine access, and ease of use also encourage tampering. Encryption and scrambling as preventive measures. Backup and recovery. Enlisting the auditor's aid.

About the Seminar Leader

Seymour Bosworth.
In data processing for more than 30 years—For the past ten years, has concentrated on uses of minicomputers in business and banking—Experience includes virtually all areas of data processing, from design and manufacture of computers through systems analysis and programming, to operation of large and small computer systems, both centralized and decentralized—Currently, Vice President, Bankers Trust Company of New York—Was President of a service bureau and computer manufacturer—Adjunct Associate Professor of Management, New York University—Frequent lecturer and author, inventor—M.S. in business, Columbia University.

The Changing Role of the DP Professional: New Rules, New Roles, New Responsibilities

Seminar Objectives—What You Will Learn

The DP field is undergoing one of the most significant changes in the area of software development since the introduction of compiler level languages. The change is on two intertwined levels: increased user sophistication and expectation—and the availability of software tools that enable a quantum jump in software developmental productivity. What is the exact nature of these changes? How will they affect DP organizations, budgets and personnel? Will they really change productivity and improve service? How much will these changes cost? What effect will they have on the bottom line? These are the provocative fundamental issues that will be dealt with in this seminar.

You Will Learn: How to introduce productivity improvement programs in your company—What effect new tools and methods will have on your work process, organization and staff—How career paths, skill levels, salaries, roles and responsibilities will change—How to measure productivity improvement—How to conduct a system development requirements survey—What new tools and methods are being used to develop systems—How other organizations are improving productivity—How to sell management on the need for improvement—How to motivate staff to change—How to use paraprofessionals and administrative assistants effectively—How to establish design models—How to select the right tools and methods—How to estimate the costs and benefits of productivity improvements.

Program Description

1. The need for change.
Software development cost and quality. Software development as the most labor intensive process in American business. The shortfall in programmers and its effect on DP organizations of various sizes. User service needs and their involvement in software development, enhancement and maintenance. The importance of high quality software. The need for fast response for user information needs.

2. The way it's been with systems development concepts and methods.
System development methodology: project life cycle, structured methods, product review and acceptance, batch program development. The roles of DP people and users in the process of developing and maintaining systems. Cost analysis. Identification of areas to be improved.

3. New developments in system development.
More "sophisticated" users. "Fourth generation" languages: system generation and program generation packages; nonprocedural languages. Programmer work bench systems and interactive software development. Program models or skeletons. Structured techniques. Data base related concepts and tools, including differentiating between high volume, production data bases and information center data bases. The use of mini and microcomputers and word processing systems as software development tools. Using paraprofessionals. Giving users "turnkey" systems.

4. Effects of new methods on staffing requirements.
The need for program designers will be reduced by the use of standard models and system generators. The programming function will be simplified, requiring less skilled and fewer programmers. Programmerless programming will evolve. Management roles and responsibilities will change as the number and type of staff members change. Roles and responsibilities of end users will change as they become more involved in the development and maintenance process. Systems analysts will become the prime movers in the system development process. Paraprofessionals and administrative people will become far more utilized. Technical and management staff must be motivated to change their methods and tools. Organizational changes may be required.

5. Effects of new methods on the work process.
Project life cycle changes: a greater proportion of the process will be in systems analysis; program design and coding will be less of the process; debugging will be easier and more thorough; analysis and implementation will overlap; documentation will be a direct result of development. Nonprocedural languages will permit enhancement and fine tuning by users. Prototyping will permit users to see system results early in the development cycle. High volume "production" data bases will be the source of less efficient but easy to access management information data bases. Data base design and administration will increase in importance. Availability of turnkey systems will increase the selection/acquisition process and decrease the development process.
New skills will be required to use new tools. The number of new applications will increase. Work environments will change.
Budgets will change.

6. How to select and implement the new methods for your environment.
Become familiar with what others are doing. Perform a system development requirements survey. Establish a five-year plan. Motivate DP management and professional staff to improve productivity. Establish a measurement method. Initiate pilot project. Sell corporate management on change. Establish a productivity improvement budget. Identify and acquire tools to fit the budget. Educate staff and users. Bring users into the process. Convert existing systems. Use paraprofessionals effectively. Begin office automation in the DP department. Evaluate results. Keep the bottom line (improved service to users at lower cost) in mind.

About the Seminar Leader

George Pitagorsky.
President of DP consulting firm, People and Solutions, Inc.—Specializes in planning, project organizations and control, and software development—Had been with Software Design Associates; Auerbach; Sperry Systems Management; Equitable Life Insurance Co.—Very active as educator in DP field—B.A. in Economics from City University of New York.

Software Engineering

Seminar Objectives—What you will learn

This concentrated seminar surveys the state of the art in software engineering for computer applications systems. Software development is placed in the overall context of system development. The application of software engineering to all types of systems, including real-time, scientific, transaction and data processing, is considered. Particularly, several case studies of real-time systems (the seminar leader's area of concern over the last few years) are presented.

You will learn:

- Understanding of current software engineering terminology; to
- develop systems that meet the users' needs; to
- develop high quality, understandable, maintainable, modifiable, reliable applications systems; to
- manage a modern software development; and how to
- introduce software engineering techniques into your company

Program Description

1. **Definition of Software Engineering**
2. **Benefits That Can Be Obtained Via Software Engineering**
3. **The Software Development Cycle**
4. **Analysis**
   - A. Desirable features of an Analysis Method
   - B. Description and evaluation of the following methods:
     1. No Analysis
     2. Classical Analysis
     3. PSL/PSA
     4. SREM
     5. Structured Analysis *a la Yourdon/Demarco*
     6. Structured Analysis *a la Sof'Tech*
   - C. Recommendations
5. **Design**
   - A. Desirable features of a Design Method or Representation
   - B. Description and evaluation of the following methods:
     1. Pipeline or Network Design
     2. Structured Design
     3. Jackson Method
     4. Warnier Method
     5. Levels of Abstraction
     6. Top Down Virtual Machine
     7. HIPO
     8. Flowcharts
     9. Nassi-Schneiderman Flowcharts
     10. Program Design Languages
   - C. Recommendations
6. **Implementation Approaches**
   - A. Desirable Features of an Implementation Approach
   - B. Description and evaluation of the following methods:
     1. Big-Bank
     2. Modified Big-Bang
     3. Top-Down
     4. Modified Top-Down
     5. Sandwich
     6. Out-In
   - C. Recommendations
7. **Coding**
   - A. Desirable Features of Coding
   - B. Description and evaluation of the following methods:
     1. Anyway Method
     2. Structured Programming
   - C. Recommendation
   - D. Programming Guidelines
   - E. Program Packaging
   - F. Language Considerations
8. **Proof of Program Correctness**
9. **Module Testing**
   - A. Testing Principles
   - B. Testing Guidelines
10. **Debugging**
11. **System Integration**
12. **System Test**
13. **Acceptance Testing**
14. **Configuration Management**
15. **Maintenance**
16. **Documentation**
17. **Staffing for Software Development**
    - A. Walkthroughs and Reviews
    - B. Program Librarian
    - C. Teaming Concepts
18. **Management of Software Development**
19. **The Development Environment**
20. **Future Trends**
21. **Getting Started**
22. **Integrated Approaches to Software Development**
23. **Summary of the Development Cycle and Recommended Practices**
24. **Battelle Columbus Laboratories' Case Studies**

About The Seminar Leader

Mr. Michael Snider received a B.S. and M.S. from Ohio State University and currently holds the position of Research Scientist at Battelle Columbus Laboratories (BCL). He has participated in the development of both data processing and real-time scientific systems. His primary area of expertise is the use of software engineering techniques to produce high-quality software. Mr. Snider currently leads the BCL Software Engineering Program.

Other activities of Mr. Snider include:

- Responsibility for the software engineering standards for a $600K development effort
- Serving as a lecturer at Ohio State University for both graduate and undergraduate courses
- Authoring or co-authoring numerous reports including one to a foreign firm on *The U.S. State-of-the-Art in Software Engineering*
- Leading the BCL review of the forthcoming DOD Language—ADA
- Participation in a Battelle-Frankfurt Software engineering effort in which Battelle-Frankfurt staff are developing an integrated software engineering methodology
- Various publications including *Software Engineering For A Real-Time Minicomputer System Application; Structured Design Works in Mini Applications, Too.*

Mr. Snider has designed and programmed eight computer systems in 12 different programming languages and is a member of the Association for Computing Machinery.

Estimating and Managing EDP Costs

Seminar Objectives—What You Will Learn

As data processing activities proliferate, there is increasing sensitivity at all levels of management about how cost-effective the DP activity is. Users, as they have become more knowledgeable about data processing, are much more demanding of the DP department in terms of the service delivered and the cost of that service. The successful DP manager is one who is able to be fully responsive and reliable in estimating or forecasting costs for individual projects and for the department as a whole—and to manage costs that are budgeted. Expense forecasting and management is tricky and complex. This seminar deals with the many variables involved.

You will learn: How cost analysis can be applied to computer operations in two distinct ways—How you can quantify the time of people and hardware—What unit cost, standard cost and actual cost are and how to determine them—How to forecast costs in detail—How to create a budget that includes the vital statistic, "value of production"—How to do a cost-benefit analysis—How cost analysis is used as a management tool, as a planning tool and as an organization tool.

Program Description

1. Defining cost.
Unit cost, as a factor in projecting pro forma operations for start-up or expansion analysis. Standard cost, for use in cost/benefit analysis, as well as user charges, cost estimates and efficiency tracking. Actual cost: identifying the actual expenditures incurred in providing resource or product to end users. Allocatable, or fixed cost, where additional user demands can be met with no immediate impact on operating budgets. Incremental, or variable cost, where additional service or product output has immediate impact on operating budget.

2. Management information aspects of cost analysis.
Labor distribution, to monitor operating efficiency. Hardware utilization, to improve production flow and product cost. Other cost elements: re-run analysis, level of service, quantitative aspects of product. Overhead: the policy, planning and procedures function. Indirect costs for general supervision of work flow. Direct costs: the "hands-on" doing of the job.

3. Cost as resource consumption.
In data processing operations, "resource" is *time* of people and equipment. How to quantify resources in dollars and cents. Cost of resources expended, by operation or service. Cost of resources expended, by job or application. Cost of resources expended, by user: expressed in terms that support the charges.

4. What DP budgeting is all about.
Operating line items for budget analysis and control. Budgets as an MIS tool for production efficiency monitoring. Operating pro formas—use in projections and capacity planning for both staff and equipment. Planning and projection of continuing user demand levels. Actual vs. budget comparisons for performance measurements. Impact of unanticipated user demand on budgets.

5. How to carry out cost/benefit analyses.
Estimating project cost for both developmental work and subsequent operations. How to set go/no-go decision points. Actual vs. estimate followup and post-implementation reviews. User/programmer/operations contributions to overall systems design—problem definition and programming. Credible and verifiable cost figures to support proposals, recommendations, requests and reports to upper management.

6. Cost as a management tool.
Using identified costs of operations to track and monitor production efficiency and improvements. Measure operating and planning improvements in dollars and cents terms. Dollar impact of problems as a means of focusing and directing management activity and problem analysis. Actual costs motivate, provide incentives re user demand, upper management decisions. Credible and supportable cost data to provide basis for operations audits. Costs provide weighted factors for planning purposes. Quantified production levels in dollars: the common denominator understood by all parties. Projecting increased requirements in both staff and equipment, reducing such requirements to budget line items. Relating demand/cost ratios to overall organizational development. Planning follow-up and post-implementation reviews for any approved requests, proposals or cost/benefit analyses.

7. Cost relationships.
Management objectives related to available resources or planned additional resource requests, in dollars and cents terms. Product quality and the trade-off between quality levels and costs. Levels of support in peripheral service areas and the tradeoffs between such levels and related costs. User demand and the impact of such demand on the operating budget and resource utilization.

8. The cost-effective operation.
Making and measuring continuing improvement in user service and product levels. Increasing levels of support without commensurate increase in operating costs. Identifying lowering unit cost as the effect of improved efficiency and increased production levels. Providing the correct options with the associated cost impact for the management decision making process. Directing resource allocation for maximum cost-effectiveness in service and product output.

9. MIS for EDP operation.
Applying computer technology internally to management of EDP operations itself. Analysis of application cost trends. Reruns, and the associated cost of reruns, to provide the basis for problem analysis and support. Management actions for reducing such activities. Establishing, demonstrating, enhancing and protecting the credibility of EDP operations through the use of verifiable cost data in communicating with upper management and the general user community.

About the Seminar Leader

Leonard Palmer.
Over 30 years of experience in data processing—Is an independent consultant specializing in EDP and computer operations management—Lectures widely and has an international reputation as a seminar leader—Has been operations manager of the State of California ADP Center—Has been with Sperry Rand and the Burroughs Corporation—Was a co-founder and President of Computer Service Centers, Inc. The company set up 12 operating subsidiaries, a leasing company, a finance company and a software development partnership.

Data Base Systems: Introduction to Technology and Design

Seminar Objectives: What You Will Learn

The effective use of technology in managing and controlling the data resources to the needs of the organization is a problem faced by data base administrators, systems programmers, data processing managers and planners. For the managers who have a need for a comprehensive understanding of the technology and design of data bases, this seminar is intended to provide you with an analysis of data structures, access methods, the components of data base management systems, the functions of data dictionary/directory systems, and the consideration for user system interfaces.

You will learn: An overview of the five most popular DBMS systems; ADABAS, IDMS, IMS, System 2000, and TOTAL—Gain the ability to assess which computer application should or should not use a DBMS—Learn the importance of planning for data integrity and security—Be made aware of future trends in the computer field and their implications for long range DBMS plans—Learn how to plan the implementation and performance of DBMS for proposed applications.

Program Description

1. Overview of the data base environment.
Definition of components of a data base environment, basic terminology, the difference between data bases and files.

2. Data bases versus the traditional approach.
Shared versus dedicated use of data. The importance of multiple logical views of a single physical representation. What is data independence? What are the practical implications?

3. Data base management in perspective.
Data base in an on-line environment. The relationship between data base and MIS. Distributed data bases.

4. Objectives of a DBMS.
Management's objective, implementation objectives, Contrasting usage objectives: sharing of data versus sophisticated access method.

5. Components of a DBMS.
Data description language for schemas and subschemas. Data manipulation language for accessing data. Storage structure definition language. The DBMS nucleus and utilities.

6. Operational memory map of a DBMS.
Interaction of components. Criteria for performance evaluation. Steps of retrieval, insertion and modification functions.

7. Principles of data structures and data modeling.
Using data structures: sequential, hierarchical and network. The relational data model. Data structure capabilities of commercial DBMS's.

8. Basic storage structures and access methods.
Access paths versus relationships. Entry access methods; random, index. Navigational access methods; embedded links, inverted indices. Storage structures and access methods in DBMS's.

9. Function of data dictionary/directory system.
What is meta data? Two types of meta data. The distinction between a dictionary versus directory. How to distinguish between an active and passive data dictionary/directory. Issues involved in independent versus dependent packages.

10. User system interfaces for a data base environment.
Factors to consider in user interfaces. High level versus low level interfaces. Guidelines for selecting interfaces.

About the Seminar Leader

Michael Salzberg.
Principal in the data processing consulting firm, The Plagman Group—An experienced data base consultant with over 10 years of extensive background in data base systems as a data base administrator, project manager and systems designer—Has been responsible for data base and data dictionary standards, data base design, disaster recovery plans, operational controls and security and data base application design review—Had been a management consultant at Peat, Marwick, Mitchell; had been with Lambda Corp.; had been a data base administrator at American Express; had been a data base specialist at Bell Laboratories—Member of ACM and IEEE—Has B.S. in mathematics from California TATE College, M.S. from University of California at Berkeley.

Data Base Systems: Advanced Technology and Design

Seminar Objectives—What You Will Learn

Today's information intensive businesses require a communications network and a full data base—central or distributed—to support operations and decision making. Many enterprises today cannot exist without on-line information. Many sites that have installed or are planning to use data base techniques find that they need a better understanding of the technology and how to use it. This seminar is intended for data processing management, data administrators, users with a good knowledge of computer systems, and professionals in the field.

You will learn: Why the data base is the hub of the organization—What sharing of data does and how it can work—How an organized Data Base Administration function can provide better service to users, quicker and cheaper—What the technical aspects of data structures, access methods, and data base design are—About the support and control functions of data management—About security, hierarchical storage management, consistency and locking, and recovery—What the future trends in technology and systems design are likely to be: secure data bases, distributed multi-copy data bases, indexed relational data bases, memory trends, magnetic bubbles, disk developments, and new archival media.

Program Description

1. Data base environment.
The role of data base management: results it permits. The increased service and reduced cost of an on-line system: how a data base makes it possible. Data sharing: why, when, what and how.

2. Data base design and administration.
Competing requirements: performance, ease of use, availability, security, extensibility, and maintainability.

3. Data base structures and models.
The ANSI model (external, conceptual, internal). Pros and cons of the network model, design techniques, and pitfalls. The hierarchical IMS system as it supports network models. The relational model: how it differs and why, normalization, relational languages. Why the relational model is superior in flexibility. How to get performance with a relational data base.

4. Data storage techniques (or access methods).
Storage structures: chain, value based, indexed, network. Clustering techniques: hashing algorithms, ISAM, place-near, sequential. Entry points and data retrieval path. Comparison of available techniques in DMS 1100, IMS, ADABAS. Secondary data paths: inverted indices, secondary chains.

5. Data base control.
Security: access, encryption, physical safeguards. Hierarchical storage management: roll out and roll back, allocation. Consistency/locking: update conflicts, deadlocks, phantom records, precision locks. Recovery: duplex, backup, quick recovery, multiple sites, distributed data bases.

6. Distributed data bases.
Why are they appealing? How to balance centralization and distribution. Technical aspects: directories, locking, definition, recovery.

7. Performance analysis.
What to measure when and how. Where are potential bottlenecks? Analysis of how each component and function module contributes.

8. Future trends.
Hardware: semiconductors, magnetic bubbles, parallel processing, optical disks, magnetic disks. Software: relational, completing the DBMS functions, DDP. Systems: query/update end user facilities, data base processors, information retrieval, distributed data bases.

About the Seminar Leader

Ronald B. Batman.
Has been in data processing for 24 years with Sperry Univac as a systems engineer, project manager, educator, senior consultant, and future-system designer—Has been involved in product management and/or development of two DBMS's, a query/update system, and two transaction processing systems as well as manufacturing and medical applications systems—Was manager, UNIVAC Systems Graduate School; currently managing a group designing future hardware/software products for data base management—has supported or managed projects at a number of major organizations (ALCOA, SAS Airlines, Ohio Bell Telephone, NDC Atlanta, Travelers Insurance, Waterbury Hospital, Barcelona Hospital, Bache & Co.).

Microcomputers and Minicomputers: When and How to Use

Seminar Objectives — What You Will Learn

Minicomputers have had, and microcomputers are having, a significant impact on all areas of data processing. Their use ranges from being "black boxes" in dedicated application-oriented systems to small business systems and intelligent terminals to intelligent peripheral controllers in large scale systems. Their influence is being felt far beyond the data processing industry and is reaching into our daily lives. There is a bewildering selection of hardware, software, vendors, and systems. The variety of potential applications is equally staggering as well as the alternative ways in which minis and micros can be utilized to support these applications. Making correct decisions is difficult at best; many factors must be considered, often with incomplete or incorrect information. This seminar focuses on micro and mini capabilities, limitations, software and support considerations, with an emphasis on the factors that enter into the decision making process of selecting the right system for the application, when and where to use a mini or micro, what to look for in specific applications, and how to avoid some of the pitfalls.

You will learn: The characteristics, capabilities and limitations of mini- and microcomputers—The range of software support: operating systems, high level languages, application software—How minis and micros support, supplement, and extend your current data processing system—What to look for and expect from manufacturer and vendor support—How to evaluate small business systems—Personnel and support requirements for mini/micro systems—Problems and pitfalls in selecting, installing and maintaining mini/micro systems—Sources of hardware, software, systems, programming support and maintenance—What to expect in future hardware, software and applications.

Program Description

1. Background/introduction.
The difference between microcomputers, minicomputers, and large mainframes is examined with regard to hardware, software, and vendor support. Hardware ranges from microprocessor chips and single board mini/microcomputers to complete systems. Vendor support ranges from sale of "black boxes" to system integration, installation and maintenance. Applications of minis and micros are reviewed.

2. Basic concepts.
Microprocessors require hardware support in form of memory chips, input/output control chips, and variety of other special purpose and increasingly sophisticated support chips. Mini-computers are grouped into three general performance/capabilities categories of 16-bit machines and now 32-bit super-minis. Microcomputers include 4-, 8-, 16-, and recently announced 32-bit computers. Peripheral devices compatible in cost and performance with minis and micros are necessary to complete the system.

3. Typical mini/microcomputers.
Characteristics of some of more popular minis and micros are outlined. Architecture, register structure, instruction set, and input/output capabilities are described.

4. Picking the software.
Selecting software is difficult because of wide range of what's available. This includes: software aids ranging from basic software development tools to disc-based multi-user operating systems—to data base management systems—to business application packages—to word processing packages. Evaluation criteria are laid out.

5. Software development systems for micros.
What you need to know about the characteristics and capabilities of special software development systems to facilitate program debugging.

6. Small business systems.
Small business systems now available include general purpose, transaction oriented, and turnkey (dedicated to a specific industry). Characteristics and costs are examined.

7. System support.
As with mainframes, small systems need good support. System selection factors to be reviewed include availability of training, installation assistance, maintenance (hardware and software), location of service office, and quality and currency of documentation.

8. Use of micros by managers; other applications.
The convenience and cost benefits of micros to corporate managers are leading to a proliferation of them outside of data processing organizations. The advantages and disadvantages of such applications will be examined. Also to be looked at is the use of minis and micros as the controlling element in many dedicated systems, such as front-end communications controllers, back-end data base controllers.

9. Future trends.
The boundaries between minis, micros and mainframes are becoming less clearly defined, giving a continuous spectrum of capabilities. The reduced cost and improved performance of electronics opens up new areas in which micros and minis can be utilized. Intelligence can be distributed to much lower levels of a system, significantly affecting the way an application is implemented. Central processors, as such, will evenutally disappear, being replaced by tightly coupled networks of minis and/or micros in applications where a central processing facility is required.

About the Seminar Leader

George R. Trimble, Jr.
A pioneer and foremost contributor to the design and application of EDP equipment—Experience includes business and scientific applications, on-line real-time systems, data communications, and the entire spectrum of systems software—Has developed wide range of applications for minis and micros—Formed his own consulting firm, T-Logic, Inc., in 1971—Had been with IBM, Computer Usage Co.—B.A. from St. John's College (Annapolis); M.A. in Mathematics from University of Delaware.

Computer Hardware for Software Engineers

Seminar Objectives—What You Will Learn

There are times when a software engineer must know about computer hardware in some detail. Often when a new hardware/software system is being constructed, software engineers must interface with hardware engineers. The software engineers might find themselves at a technical disadvantage when trying to communicate with their hardware counterparts. In companies where there are no hardware experts, software engineers often find themselves being asked about prospective hardware purchases. Probably the most common example is the greater use of microcomputers and microprocessors, either by themselves or embedded in other technology. It seems that the smaller the system, the more the software engineer must know about the hardware. The objective of this course is to give software engineers an introduction to computer hardware. The material will be presented from a software engineer's point of view.

You will learn: To deal with hardware concepts at a level appropriate to your needs—To identify and become familiar with major hardware components such as: memory (primary, secondary, virtual and cache), the ALU, the control unit, buses, disk systems, tape systems, analog-to-digital converters and digital-to-analog converters, modems, concentrators, multiplexers, controllers—To lay out a high-level design of a simple computer hardware system—To evaluate simple and moderately complex logic.

Program Description

1. The logic of the computer.
Boolean algebra: AND, OR, NOT, XOR, truth tables, and logic equations. Logic components: the symbols (gates) for the Boolean functions and how they operate. Elementary devices: flip-flops, adders, counters, and registers are described. Synchronous and asynchronous logic are also discussed.

2. What makes a computer a computer?
Computer components: the five basic components of every computer. The arithmetic logical unit: the organization and implementation of the CPU component. The control unit: organization and operation of this unit; microcode and writeable control stole. Memory: core, semiconductor, RAM, ROM, PROM, and EPROM will be covered. Cache and virtual memory.

3. CPU organization and operation.
Bus structures and operation: three characteristics of buses. Timing, bandwidth, and bus protocol. Execution cycles: the three steps of an instruction execution cycle. Memory access: DMA, programmed I/O, and memory mapped I/O are compared. CPU example: An elementary CPU is constructed, using the previously presented examples.

4. Computer peripherals.
Disks: the principles of disk construction and operation. Winchester technology, IBM's 3380 disk drives, and thin film technology. Tape: all types of tape systems (e.g., open reel, cassette, and cartridge), as well as tape system operations, are reviewed. Terminals: both TTY and CRT types. RS/232, current loop interface, buffered I/O. Printers: various types of printer technology, including thermal, ink-jet, laser and COM.

5. Communications.
You are introduced to synchronous and asynchronous communications, serial and parallel communications, protocols, concentrators, and multiplexers. Simple networking techniques. Analog-digital: you will be given explanations of digital-to-analog converters and analog-to-digital converters.

6. Examples and comparisons of several current computer architectures.
DEC: PDP-11/44 and VAX 11/780. IBM: the 303X family. Intel: the 8080 and 8086. Plus other architectures.

7. Hardware trends.
Future: the "IBM 370 on-a-chip," Josephson junctions, and VLSI technology. State-of-the-art: Current state of the art in computer hardware is examined in detail.

About the Seminar Leader

Edward V. Berard.
An international consultant whose experience includes systems design and documentation, very large data bases, networking systems, code optimization, mathematical modeling, numerical analysis, computer graphics and computer science education—Clients have included General Motors, General Electric, General Dynamics, Bell and Howell, Control Data—Member, ACM, IEEE—B.S. in chemistry from University of Maryland; graduate work in quantum mechanics, advanced mathematics, numerical analysis, chemical physics at University of Maryland and University of Southern California.

Battelle Data Processing Seminar Schedule

Strategic Planning for Management Information Systems

New York	July 22-23	Barbizon	(212) 247-7000
San Francisco	Aug. 20-21	Sir Francis Drake	(415) 392-7755
Washington, D.C.	Sept. 14-15	Capital Hilton	(202) 393-1000
Houston	Oct. 21-22	Marriott West Loop	(713) 960-0111
Chicago	Nov. 12-13	Sheraton-Plaza	(312) 787-2900
New York	Dec. 16-17	Barbizon	(212) 247-7000
San Francisco	Jan. 20-21, 1982	Santa Clara Marriott	(408) 988-1500
Boston	Feb. 18-19, 1982	Lenox	(617) 536-5300
Seattle	Mar. 22-23, 1982	Battelle	(206) 525-3130

Decision Support Systems

Seattle	Aug. 4-5	Battelle	(206) 525-3130
New York	Sept. 16-17	Barbizon	(212) 247-7000
Washington, D.C.	Oct. 5-6	Shoreham	(202) 234-0700
Los Angeles	Nov. 4-5	Pacifica	(213) 649-1776
Dallas	Dec. 1-2	Sheraton	(214) 748-6211
Seattle	Feb. 4-5, 1982	Battelle	(206) 525-3130
Boston	Mar. 18-19, 1982	Lenox	(617) 536-5300

Data Communications: An Intensive Introduction

New York	July 14-15	Barbizon	(212) 247-7000
Seattle	Aug. 11-12	Battelle	(206) 525-3130
Boston	Sept. 14-15	57 Park Plaza	(617) 482-1800
Los Angeles	Oct. 12-13	Pacifica	(213) 649-1776
New York	Nov. 16-17	Barbizon	(212) 247-7000
Houston	Dec. 7-8	Stouffer's	(713) 629-1200
New York	Feb. 18-19, 1982	Barbizon	(212) 247-7000
Columbus	Mar. 18-19, 1982	Sheraton	(614) 228-6060
Seattle	Apr. 19-20, 1982	Battelle	(206) 525-3130

Distributed Data Processing: Application of Minis and Micros

Washington, D.C.	Sept. 16-17	Capital Hilton	(202) 393-1000
Los Angeles	Oct. 19-20	Pacifica	(213) 649-1776
New York	Nov. 17-18	Barbizon	(212) 247-7000
Seattle	Dec. 7-8	Marriott	(206) 241-2000
Boston	Feb. 8-9, 1982	Lenox	(617) 536-5300
Houston	Mar. 8-9, 1982	Stouffer's	(713) 629-1200

Data Base Systems: Advanced Technology and Design

Houston	Nov. 16-17	Adam's Mark	(713) 978-7400
Seattle	Feb. 18-19, 1982	Battelle	(206) 525-3130
Washington, D.C.	Mar. 8-9, 1982	Washington Marriott	(202) 872-1500
San Francisco	Apr. 15-16, 1982	Sheraton Fisherman's Wharf	(415) 362-5500

Data Base Systems: Introduction To Technology and Design

Boston	Sept. 14-15	57 Park Plaza	(617) 482-1800
New York	Nov. 16-17	Barbizon	(212) 247-7000
Chicago	Dec. 14-15	Continental Plaza	(312) 943-7200
Washington, D.C.	Feb. 8-9, 1982	Dulles Marriott	(703) 471-9500
Seattle	Mar. 8-9, 1982	Battelle	(206) 525-3130
New York	Apr. 19-20, 1982	Barbizon	(212) 247-7000

Estimating and Managing EDP Costs

New York	Aug. 11-12	Barbizon	(212) 247-7000
San Francisco	Sept. 14-15	Sir Francis Drake	(415) 392-7755
Washington, D.C.	Oct. 7-8	Washington Marriott	(202) 872-1500
Boston	Nov. 16-17	57 Park Plaza	(617) 482-1800
Dallas	Dec. 7-8	Sheraton	(214) 748-6211

Computer Hardware For Software Engineers

Washington, D.C.	Aug. 10-11	Marriott Key Bridge	(703) 524-6400
Boston	Sept. 24-25	57 Park Plaza	(617) 482-1800
New York	Oct. 22-23	Barbizon	(212) 247-7000
Chicago	Nov. 2-3	Continental Plaza	(312) 943-7200
San Francisco	Nov. 30-Dec. 1	Hyatt Rickeys	(415) 493-8000
Washington, D.C.	Feb. 4-5, 1982	Dulles Marriott	(703) 471-9500
New York	Mar. 18-19, 1982	Barbizon	(212) 247-7000
Seattle	Apr. 22-23, 1982	Battelle	(206) 525-3130

Data Processing Contracts: Negotiating and Administration

New York	Oct. 13-14	Barbizon	(212) 247-7000
Los Angeles	Dec. 3-4	Biltmore	(213) 624-1011
Washington, D.C.	Jan. 18-19, 1982	Dulles Marriott	(703) 471-9500
Seattle	Feb. 4-5, 1982	Sea-Tac Marriott	(206) 241-2000
Boston	Mar. 4-5, 1982	Lenox	(617) 536-5300
San Francisco	Apr. 5-6, 1982	Santa Clara Marriott	(408) 988-1500

The Changing Role of the DP Professional: New Rules, New Roles, New Responsibilities

Chicago	Oct. 15-16	Sheraton-Plaza	(312) 787-2900
Atlanta	Dec. 3-4	Peachtree Plaza	(404) 659-1400
Los Angeles	Jan. 7-8, 1982	Biltmore	(213) 624-1011
Boston	Feb. 4-5, 1982	Lenox	(617) 536-5300
Seattle	Mar. 11-12, 1982	Battelle	(206) 525-3130
New York	Apr. 22-23, 1982	Barbizon	(212) 247-7000

Data Processing and Office Automation: Technology and Management

Boston	Oct. 13-14	57 Park Plaza	(617) 482-1800
Seattle	Nov. 16-17	Marriott	(206) 241-2000
New York	Dec. 10-11	Barbizon	(212) 247-7000
San Francisco	Feb. 8-9, 1982	Santa Clara Marriott	(408) 988-1500
Washington, D.C.	Apr. 15-16, 1982	Washington Marriott	(202) 872-1500

Microcomputers and Minicomputers: When and How to Use

Dallas	Oct. 22-23	Doubletree Inn	(214) 691-8700
Minneapolis	Nov. 17-18	Hyatt Regency	(612) 370-1234
New York	Dec. 8-9	Barbizon	(212) 247-7000
San Francisco	Feb. 4-5, 1982	Sheraton Fisherman's Wharf	(415) 362-5500
Washington, D.C.	Mar. 18-19, 1982	Washington Marriott	(202) 872-1500
Seattle	Apr. 15-16, 1982	Battelle	(206) 525-3130

Software Engineering

Seattle	July 20-21	Bellevue Hilton	(206) 455-3330
Minneapolis	Aug. 3-4	Radisson South	(612) 835-7800
Columbus	Aug. 20-21	Sheraton	(614) 228-6060
Los Angeles	Oct. 8-9	Marriott Marina Del Rey	(213) 822-8555
Detroit	Oct. 22-23	Detroit Plaza	(313) 568-8000
Chicago	Nov. 16-17	Chicago Marriott	(312) 836-0100
Fort Lauderdale	Dec. 7-8	Marriott-Marina	(305) 463-4000
Dallas	Jan. 21-22, 1982	Sheraton	(214) 748-6211
Atlanta	Feb. 4-5, 1982	Terrace Garden	(404) 261-9250
Columbus	Feb. 18-19, 1982	Hyatt Regency	(614) 463-1234
Boston	Mar. 18-19, 1982	Lenox	(617) 536-5300
San Francisco	Apr. 15-16, 1982	Hyatt on Union Square	(415) 398-1234

Registration Information

Fees

The fee for each participant is $495 and includes all reference materials, luncheons, and refreshment breaks. It does not include overnight accommodations. Fees are payable in advance (approved government purchase orders meet this requirement). Please note that although we accept "last-minute" registrations, we urge you to contact us prior to the seminar to be sure that space is available and there has been no change in time, date or location.

Attendance Limitation

Attendance is limited. *Please register early.* To register, or for more information, write or call the Registrar, Battelle Seminars and Studies Program, 4000 N.E. 41st Street, Seattle, Washington, 98105. Telephone, 206-527-0542 or outside Washington State call toll free, 1-800-426-6762.

Accommodations

The Battelle Seminars and Studies Program has reserved a block of rooms at each meeting site. If you wish accommodations, please contact the site directly to reserve space. Be sure to indicate that you are attending a Battelle seminar. *We urge you to make hotel reservations early.*

Hours

Program hours: On the first day, registration will be from 8:30am to 9:00am; the program will be from 9:00am to 5:00pm. Program hours are from 8:30am to 4:00pm on the second day (9:00am to 4:30pm for Software Engineering only).

Reference Materials

Each participant will be provided with a full comprehensive workbook containing detailed information with lasting reference value.

CEUs

Because of the importance of continuing education, a nationally recognized credit system has been established. For each two-day seminar, you will receive 1.2 Continuing Education Units.

In-House Seminars

Most of these seminars, plus others, are available for presentation at your own facility for 20 or more people. *The benefits to your organization are:* lower cost per attendee; you choose the location; you choose the timing; you have greater freedom in discussing your own problems with the instructor. You may take advantage of this opportunity today by writing or calling the Registrar. (See registration form.)

Registration Form

Program Name _____

Program Location _____ Program Date _____

Name _____ Title _____

Name _____ Title _____

Organization _____

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On most address labels numbers or letters will appear above or beside your name, please record that information here _____

☐ This confirms a telephone registration.
Bill my: American Express ☐ Visa ☐ Master Card ☐

☐ Check enclosed (Make checks payable to Battelle).
☐ Bill my company (Fees are payable in advance).

Please provide the following information:

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